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ABSTRACT

This paper explores the background to and process of quality circles as well as the implications of circles for training. In the first section, the emergence and growth of quality circles in Japan and the United States are traced. Next, the theoretical and conceptual bases of quality circles are examined, while section 3 looks at implementation in detail. Discussed are the goals of circles; steps in implementation; the principles of operation, organization, and staffing; the operation of quality circles; and the evaluation of benefits of quality circles. The fourth section describes the extent and types of quality circle training that can be delivered. It is followed by a discussion of quality circles and implications for training, giving an overview of who is trained, what kind of training is received, what kinds of considerations are made in designing and conducting training, and the outcomes or end results of the training process. A final section considers some unresolved issues relative to the concept and practice of quality circle training. Essentially, basic problems and needs are named in the areas of management/supervision, research, and education. Appended materials include abstracts of circle activities in various companies around the country, a case study, and results of a survey of several companies' involvement with quality circles. (CT)

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QUALITY CIRCLES:

IMPLICATIONS FOR TRAINING

INFORMATION SERIES NO. 243

Carl L. Harshman
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The ERIC Clearinghouse on Adult, Career, and Vocational Education
The National Center for Research in Vocational Education
The Ohio State University
1960 Kenny Road
Columbus, Ohio 43210

1982

U.S. DEPARTMENT OF EDUCATION
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TABLE OF CONTENTS

Page

LIST OF FIGURES v

FOREWORD vii

EXECUTIVE SUMMARY ix

INTRODUCTION 1

THE HISTORY OF QUALITY CONTROL CIRCLES 3

- The Japanese Experience 3
- The American Experience 4

THEORETICAL AND CONCEPTUAL BASES OF QUALITY CIRCLES 7

ORGANIZATION AND IMPLEMENTATION OF QUALITY CIRCLES 11

- Goals of Quality Circles 11
- Steps in Implementing Quality Circles 12
- Principles of Operation 12
- The Benefits of Quality Circles 17

TRAINING FOR QUALITY CIRCLES 21

- Training for Management 21
- Facilitator Training 22
- Team Leader Training 22
- Circle Member Training 24

QUALITY CIRCLES AND THE IMPLICATIONS FOR TRAINING 27

- Who Is Trained? 27
- What Kind of Training? 28
- Considerations for Training 29
- Outcomes of the QC Process and Training 29
- Summary 30

TABLE OF CONTENTS - Continued

Page

SOME UNRESOLVED ISSUES IN THE QUALITY CIRCLE PHENOMENON 31

The Role of Management and Supervision 31
Research 31
Education 32
Summary 32

APPENDIX A: Excerpts of Reports on Quality Circle Activities in Various Industries 33

APPENDIX B: Sample Tools of Problem Analysis and Solution: Dover Elevator Q Squad Case 39

APPENDIX C: Results of a Survey of Eighteen Companies' Involvement in Quality Circles 53

REFERENCES 63

SELECTED BIBLIOGRAPHY 67

LIST OF FIGURES

		Page
Figure 1.	Human development theory bases of quality circles	8
Figure 2.	Organizational structure and the place of quality circles	14
Figure 3.	The Martin Marietta model of quality circle measures	18
Figure 4.	Examples of task and group process training modules for QC team leaders	23

FOREWORD

The Educational Resources Information Center Clearinghouse on Adult, Career, and Vocational Education (ERIC/ACVE) is one of sixteen clearinghouses in a nationwide information system that is funded by the National Institute of Education. One of the functions of the Clearinghouse is to interpret the literature that is entered into the ERIC database. This paper should be of particular interest to vocational education practitioners and decision makers, human resource developers, and personnel managers within business and industry.

The profession is indebted to Carl L. Harshman of Saint Louis University for his scholarship in the preparation of this paper. Dr. Harshman has worked as an hourly employee in industry, a construction superintendent, and a college dean. In 1972, after completing his Ph.D. at The Ohio State University, he joined Saint Louis University and worked in institutional research and academic planning. From 1975-82, he served as dean of Metropolitan College and professor of education. Currently he is on leave from the University, working as a consultant to industry for quality of work life and worker participation programs.

Recognition is also due to Wayne S. Rieker, President, Quality Control Circles, Inc.; Robert H. Vaughn, Lakeland Community College, Mentor, Ohio; and to Roy L. Butler and Kenneth F. Huddleston, the National Center for Research in Vocational Education, for their critical review of the manuscript prior to its final revision and publication. Susan Imel, Assistant Director at the ERIC Clearinghouse on Adult, Career, and Vocational Education, coordinated the publication's development. She was assisted by Sandra Kerka, Catherine Thompson and Judith O. Wagner. Carmen Smith, Catherine Smith, and Brenda Hemming typed the manuscript, and Janet Ray served as word processor operator. Connie Faddis of the National Center's Editorial Services edited the paper.

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EXECUTIVE SUMMARY

This paper explores the background to and process of quality circles as well as the implications of circles for training. In the first section, the emergence and growth of quality circles in Japan and the United States are traced. Next, the theoretical and conceptual bases of quality circles are examined, while section 3 looks at implementation in detail; discussed are the goals of circles, steps in implementation, the principles of operation, organization, and staffing, the operation of quality circles, and the evaluation of benefits of quality circles. The fourth section describes the extent and types of quality circle training that can be delivered. It is followed by a discussion of quality circles and implications for training, giving an overview of who is trained, what kind of training is received, what kinds of considerations are made in designing and conducting training, and the outcomes or end results of the training process. A final section considers some unresolved issues relative to the concept and practice of quality circle training. Essentially, basic problems and needs are named in the areas of management/ supervision, research, and education. Appended materials include abstracts of circle activities in various companies around the country, a case study, and results of a survey of several companies' involvement with quality circles.

Literature relating to the topic of the quality circle and its implications for worker training can be found in the ERIC system under the following descriptors: *Training Methods; *Program Design; *Program Content; *Program Implementation; Program Evaluation; Delivery Systems; *Job Training; Management Development; Problems. Asterisks indicate descriptors having particular relevance.

INTRODUCTION

The United States may be experiencing the most significant change in the work place since the Industrial Revolution. The movement involves changing relationships among owners/managers, supervisors, and employees. The umbrella label for the movement is *quality of work life*. Quality of work life, or QWL, was defined by one group as:

> a broad expression covering a vast variety of programs, techniques, theories, and management styles through which organizations and jobs are designed so as to grant workers more autonomy, responsibility, and authority than is usually done. (Jenkins 1981, p. 7)

QWL efforts include such things as job redesign, work restructuring, socio-technical systems, and job enrichment (Walton 1979).

An increasingly popular work improvement effort is the quality control circle (QCC) or simply quality circle (QC).* Rieker (1981a) provides a comprehensive list of the key elements of a quality control circle (his term):

1. *members* of the normal organizational *work crew* and their *supervisors*,
2. meeting on a *voluntary* basis,
3. at *regularly scheduled* periodic meetings,
4. to receive *training* in problem-solving techniques,
5. then *identifying* and *prioritizing* problems, *investigating* and *analyzing* causes,
6. and *developing* and *implementing solutions* when the authorization to do so is within its purview. (pp. 1-2)**

Based on a concept imported from Japan in the early 1970s, the quality circle has become a fast-growing national phenomenon involving thousands of supervisors and employees.

Quality circles did not occur by accident. They were one response to a much larger, more complex social/cultural work movement of the last three decades. Some elements of the movement, according to Rendall (1981), were—

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*There is some debate about the appropriate label for the phenomenon. The Japanese call their groups "quality control circles," and adherents to the concept use the term. Because of the narrow interpretation of "quality control" in the U.S., many organizations allow groups or teams to address problems other than those related to quality. In many cases these organizations or groups prefer the term "quality circle." For the sake of consistency, this paper uses the term quality circle (QC) as a generic phrase for the concept.

**Emphasis is the author's.

- a shift from workers who were predominantly self-reliant to those who were more dependent on their peer group;

- workers who became more outer-directed and demanded more from jobs that had become "standardized, specialized, and fragmented tasks devoid of challenge" (p. 29);

- production systems that were extremely cost-effective, but those same qualities dehumanized work and underutilized the human resources in the system.

Franklin (1981) reported on two studies that affirmed these problems. In one, a poll of one hundred seventy-five thousand workers in 159 companies revealed that most felt they were not respected as individuals and that their jobs were not challenging. The other study revealed extensive negative attitudes about work, but also affirmed that more money, shorter hours, or longer vacations would not solve the problem.

At the same time that the American work force was changing, additional motivation for installing QCs came from leadership of companies faced with economic hard times. These companies acknowledged the human elements of the process but, in many cases, saw QCs primarily as economic/productivity tools.

The early circles appeared in industrial or manufacturing organizations. They were dedicated to improving product quality, increasing productivity, and containing costs. Although those outcomes looked like payoffs for the company only, the benefits for workers were (1) increased job security because of enhanced company performance, (2) the opportunity to achieve deeper and more intensive relationships to their work (an intrinsic reward), and (3) the chance to make a difference in the work place.

The purpose of this paper is to explore the background and process of quality circles, as well as the implications of circles for training. To that end, the paper contains sections on the history of quality circles, the theoretical and conceptual bases of QCs, the implemention of quality circles, and the training components of circles. The final section looks at some of the unresolved issues surrounding quality circles.

There are three appendixes to the report. Appendix A contains abstracts of circle activities in various companies around the country. Appendix B "walks through" an actual problem solved by a circle at Dover Elevator. It shows how the circle members selected the problem, how they analyzed it, and how they solved it. Appendix C contains the results of an in-depth survey of several companies' involvement with QCs. The survey was designed to gather data on the growth of QCs, as well as on some quantitative aspects of circle programs.

THE HISTORY OF QUALITY CONTROL CIRCLES

This section traces the emergence and growth of quality circles in Japan and the United States. As the history reveals, there is an increasing movement of ideas from the U.S. to Japan, and back to the U.S., over a twenty-five year period.

The Japanese Experience*

According to Beardsley (1981), by the early 1940s the Japanese were known as the "junk merchants of the world." In the post-World War II era Americans made two contributions to a change in Japanese production. One was the commitment of General Douglas MacArthur to put the Japanese economy back on its feet. The other, related to MacArthur's efforts, was the Japanese government's willingness to support the effort. Legislation, for example, provided for Japanese Engineering Standards, which provided guidelines for upgrading existing standards (Cole 1980a). The law also allowed companies that met various standards, including quality, to use the Japanese Industrial Symbol (JIS) on their products (Yager 1981).

The second major American contribution came from Dr. Edward S. Deming, who gave the Japanese information on methods of statistical quality control. In 1951 the Japanese Union of Scientists and Engineers (JUSE) honored Deming's contribution by creating a Deming award. The "Deming Application Prize" is now awarded nationally to companies rated excellent for their application of statistical quality control methods.

In 1952 Deming introduced Dr. Joseph M. Juran of the United States to the founder of the Japanese Union of Scientists and Engineers. In 1974 Juran went to Japan for two months to deliver lectures on the "management of quality control." By this time, the Japanese had identified some of the causes of their quality problems and had begun to acquire some technical tools to upgrade quality, but lacked an overall strategy on how to integrate the techniques into industries. The general strategy shifted responsibility for quality control from "engineers with limited shop experience to . . . each employee." (Cole 1980a, p. 25) The Japanese decided that the way to do this was through education and, because of the target group, they adopted an innovative strategy. Juran described it as follows:

> Under the Japanese system of organizing work, it became logical to extend training in quality control to the category of "GEMBA-CHO". The Gemba-Cho is a sort of "working foreman," i.e., he is partly a work leader and teacher, and sometimes a production worker. Since this category of Gemba-Cho consists of many thousands of people, it was necessary to resort to mass media for training. Japanese ingenuity rose to the occasion by creating new training forms as well as by adapting conventional forms. (1967, p. 331)

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*Kaoru Ishikawa's *QC Circles Activities*, published by the Union of Japanese Scientists and Engineers (1968), is recommended for a more in-depth historical review of QCCs.

Education strategies included a series of ninety-one, fifteen-minute radio programs first aired in 1956 and repeated every year until 1962. In addition, one hundred thousand copies of a text on quality control were sold in the first year. In 1960 the Japanese designated November as "National Quality Month," and a television series on quality control was aired.

In 1961, the Japanese *Quality Control Magazine* held a symposium for shop foremen. As a result of discussion and ideas, a new magazine emerged (first called "Gemba-To-QC" and later "FQC [QC for the foreman]"). It was aimed more at the shop floor level, and a new awareness of the possible contribution of these workers arose. At about the same time, Dr. Kaoru Ishikawa developed a charting technique for breaking down a problem. This is now referred to as cause-and-effect analysis. According to Patchin, "JUSE . . . coupled the works of Dr. Ishikawa and the Americans, and developed the first Quality Control Circles training materials in 1962." (1981, p. 7) Soon after, the materials were promoted to Japanese industry, but surprisingly, Patchin said, companies were slow to respond.

In the beginning, three QC circles registered with JUSE. Twenty more registered by the end of 1962 and eight thousand by August, 1966. By 1967 there were twelve thousand circles registered and an estimated sixty thousand not registered (Yager 1981). Cole said that there were an estimated eighty-seven thousand circles by 1978 and according to Rieker (1981a), there are now over one hundred twenty-five thousand circles registered with the JUSE.

The American Experience

In the mid-1960s the United States became aware of the gradual upgrading of the quality of Japanese products. In addition, U.S. scholars and managers began to realize that one of the reasons for these improvements was the quality control circle. In 1971 *Production Magazine* first reported a quality circle-type experience in a California medical instrument manufacturing firm. Encouraged by the head of the company, a group of employees began meeting to formulate suggestions and recommendations for improvements (Patchin 1981). Gregerman (1979) reported that Powell Niland's 1971 book, *The Quality Control Circle: An Analysis*, was one of the first publications in this country to define and describe the Japanese QCC phenomenon.

What is generally considered the first U.S. quality circle project took place in Lockheed's Missile System Division in 1973. The manufacturing manager, Wayne Rieker, took a Lockheed group to Japan to study QCCs. According to Rieker (1981a), Lockheed implemented the Japanese approach in its pure form (versus "Americanizing" it). It took about a year to get necessary approvals and to develop training materials. Initially, four pilot groups were set up. After a short period a survey was taken of the people involved. According to Rieker, the results were as follows:

> 90% voted to continue and expand the program; 92% said communications had improved; 85% said quality improved; and 71% found their jobs to be more enjoyable. (1981a, p. 7)

Rieker reported that a similar 1979 survey at Westinghouse confirmed the earlier Lockheed findings.

There were two major characteristics of the American experience with quality circles. The first was the phenomenal growth of companies and organizations involved in QCs. The early entrants to the trend included such companies as Hughes Aircraft, Ford Motor Company, General Electric, Bank of America, and General Motors. By now hundreds or even thousands of other companies have instituted QCs. Although the initial thrust came from industrial

organizations, Yager says, "a significant interest has been shown in this country by hospitals, banks, service organizations, accounting, engineering and professional firms" (1981, p. 9). The second characteristic was the adoption of a relatively standard process for implementing QCs. These included the formation of a steering committee (may be seen less frequently than other components), the appointment of a staff facilitator, the selection of members, training, and so forth.

Even though there has been significant growth of the phenomenon in the U.S., Robert Cole, a recognized authority on QCs, has some major concerns about the appearance and implementation of QCs. For one, he is concerned about the motives of institutions:

> Despite the variety of explanations company officials give for their interest, the desire to raise productivity and improve quality seems paramount, often in the face of increasing competition from the Japanese. With these concerns goes the recognition that perhaps they have underutilized the worker as an organizational resource. (Cole 1980b, p. 28)

This seems to indicate a concern more for profit than for people. (Many argue that the two must go hand-in-hand in QCs.)

A second concern is the relationship of unions to the effort. According to Cole, the unions in Japan are part of the collaborative planning process for circles. In this country, involvement is not consistent. In some cases union involvement is mandated by the master collective bargaining agreement; in others it is a function of the company. A strong advocate of union-management cooperation is Irving Bluestone, retired vice president of the United Auto Workers' (UAW) General Motors Department. Bluestone (1978) maintains that any effort directed toward increasing the dignity and respect of workers and increasing workers' fulfillment requires mutual cooperation between management and the union. Bluestone's position on the necessity of cooperation between union and management is supported by D. L. "Dutch" Landen, director of Organizational Research and Development for General Motors. According to Landen:

> No two systems which have a natural interdependency can create or maintain an optimal existence if the forces that energize both systems are antagonistic with one another. (1980, p. 24)

The initial support for joint efforts occurred in the UAW and has now spread to other unions. From many modern union leaders, the message is clear: if you are going to do something like quality circles, both parties should be involved.

Finally, there is a question about whether quality circles are appropriate to this country. Cole raises the question because there are Japanese companies with successful QC efforts in Japan that have not installed circles in their U.S. plants. Other Japanese companies, such as Honda, have successfully installed QCs in U.S. plants.

Even with these concerns, it is clear that quality circles are fast becoming a way of life in American industry. The next section of this paper deals with the theoretical and conceptual bases of the movement.

THEORETICAL AND CONCEPTUAL BASES OF QUALITY CIRCLES

The Japanese acquired the concept and technology of quality control, developed the tools for problem analysis, and integrated them into the people-oriented culture of the work place. The American experience took the opposite tack. The U.S. had technology and such things as statistical control techniques, but lacked skills in managing the human side of the enterprise. As a result, the development of QCs in this country focused as much energy on the human development theory base as the Japanese did on the quality control theory.

Much of what is written about the bases of QCs focuses on the human characteristics of the system. Beardsley says, "The Quality Circle process is a . . . system based upon a philosophy which recognizes individual workers as total human beings who desire to participate in decisions affecting their work." (1981, p. 1-2-1) The theory bases address the three major elements of the QC process:

- Management style
- Elements of satisfying work
- Satisfaction of human needs (motivation)

The works of McGregor (1960), Herzberg (1966), and Maslow (1954) provide most of the theoretical background for QCs. The relationship of these various theories to quality circles is outlined in figure 1.

In order for circles to grow and develop, management must view employees as more than labor resources or extensions of machines. In addition, management must be willing to accept input from employees. McGregor's contribution lies in his analysis of the relationship between managers' assumptions about human beings (Theory X or Theory Y) and the management style adopted to get maximum results from people ("tough" versus "soft"). McGregor felt that Theory Y was preferable. According to Hall:

> Theory Y represents an approach to accomplishing work through others which is based on a recognition that people want to do meaningful work and that, if given the opportunity, they will act responsibly and creatively in order to make their work meaningful. (1965, p. 5)

This theory provides a rationale for the management style needed to institute and maintain quality circles.

Organizational Aspect	Theory	Elements of the Theory
Management Style	McGregor's Theory X – Theory Y	Theory Y—The management style views employees positively and incorporates them into the management proccess.
Elements of Work	Herzberg's Two-Factor Theory	There appear to be factors that enhance and detract from job satisfaction. Such things as achievement, recognition, advancement, growth, responsibility, and the work itself are possible enhancing factors.
Motivation: Satisfying Human Needs	Maslow's Hierarchy of Needs	People have different kinds/levels of needs— Physiological Security/Safety Social/Belonging Ego/Self Esteem Self Actualization Work can meet, to some extent, all of these needs

Figure 1. Human development theory bases of quality circles.

Herzberg's theory (1966) describes the factors that contribute to job satisfaction. Since there are considerable data about the deep dissatisfaction of the American workers with their jobs, and since most of the jobs generating dissatisfaction do not embody Herzberg's characteristics, it is assumed that jobs with other characteristics would produce more satisfactory results.* Quality circles are designed to add many of the characteristics of Herzberg's job enrichment strategy to work, thus providing a climate for motivating people.

Finally, the American work place has used a fairly simple "carrot and stick" approach to motivation. Such an approach ignores a whole range of human needs, such as belonging, self-enhancement (ego development), and so forth. Maslow's theory assumes that if jobs incorporate elements that satisfy some higher-order human needs, they then provide additional motivating potential. Quality circles provide many opportunities to fulfill higher-order human needs

*The author has interviewed over 500 hourly (union) and salaried employees in the last eighteen months. The proposition is strongly supported in these interviews.

(belonging, recognition, achievement, and so forth) and, as such, should add to the motivation of the American worker.

With a deeper understanding of the various theories, one begins to see the relationship between the propositions about human beings, the discrepancies between people and the structure of their work, and how QCs might bridge the gap.

In addition to the human development theory, there is an organizational development (OD) theoretical base that some think is pertinent. The basic question about the relevance of OD theory is whether quality circles are an addition to the existing structure* of the organization (with appropriate organizational modifications to make them work), or whether they are part of a larger, long-term intervention that requires or will result in fundamental changes in the organization. For example, the question of whether or how to involve the union(s) would be handled differently if the installation of QCs was viewed as an addition to the system rather than a reflection of a larger effort to change some long-standing traditions and relationships. This topic has been largely ignored in the literature to date. For two views on the issue of QCs as an OD tool, the reader is referred to Cole (1980b) and Mills (1981).

*See, for example, Yager (1981).

ORGANIZATION AND IMPLEMENTATION OF QUALITY CIRCLES

This section discusses the elements of implementation of quality circles. There are discussions of the goals of circles; steps in implementation; the principles of operation, organization, and staffing; the operation of QCs; and the evaluation of benefits of QCs.*

Goals of Quality Circles

There are two kinds of goals inherent in the creation and operation of quality circles. Some goals reflect the interests of the organization (and, indirectly, the interests of the employees), while other goals reflect the interests of the employees (and, indirectly, the interests of the organization). The key to long-term success of QCs is for the two kinds of goals to complement each other.

Examples of goals that serve the organization are—

- to improve the quality of the product manufactured or the service provided;
- to reduce the costs of the product or service by eliminating such things as unnecessary errors or defects;
- to increase productivity by solving problems that interfere with reasonable production capability;
- to improve communication within the organization.

While such goals indicate one kind of outcome for the quality circle process, other goals serve the interests of the employees. Examples of these goals are—

- to permit employees to use a greater amount of knowledge and skill than most jobs allow;
- to provide a vehicle whereby relationships among workers improve;
- to provide employees the opportunity to gain more control over their work by allowing them more input to factors that affect it;
- to enrich jobs through greater involvement in the work process.

In the process of organizing and implementing quality circles, a company or organization should explore both types of goals, and be certain that there is a reasonable balance. This balance will help ensure the success and permanence of the QC effort.

*The training components of QCs are discussed in the following section.

Steps in Implementing Quality Circles

Kaoru Ishikawa's (1968) publication on formation principles for quality control circles is a basic source on how to implement QCs. The process recommended by Dr. Ishikawa includes (1) being certain that the key groups in the organization (e.g., management, engineers) thoroughly understand the process; (2) familiarizing middle managers and first-line supervisors with the process; (3) deciding on implementation through a democratic process; (4) monitoring the process closely; and (5) developing a set of rules and regulations for administering the process.

The basic approach in this country is similar to Ishikawa's, but takes a slightly different tack because of the nature of American organizations. Understanding and commitment of top management is the critical first step. At or near the beginning of the installation process, the labor union (if present) should be involved. In Japan, such involvement would come naturally, but that may not be the case in this country. Evidence of successful efforts to date indicate that union involvement is important.

The subsequent steps, according to Philip Thompson, program coordinator at the Martin Marietta Michoud Division, are as follow:

- A "middle down" strategy that actively involves middle managers and supervisors in the process of circle formation, training, and operation.
- Intensive training for all participants—managers, technical specialists, supervisors, employees, and advisors (part-time or full-time)
- Preparation of the organization so that it can effectively offer incentives for employees to participate, provide technical expertise to circles, implement circle proposals, and measure the impact of the quality circle process.
- Establishment of rules and procedures for the quality circle process, such as circle formation, leader selection, management presentation, reporting, and variations in circle structure (n.d., p. 5).

The process should be slow and systematic in implementing the steps. Taking shortcuts or skipping steps in order to get circles functioning may risk the long-term viability of the effort.

Principles of Operation

The American experience with QCs has yielded a number of principles required for success in this country. The principles, gathered from several sources (Cole 1980b; Beardsley 1981; Rieker 1981a) are divided into two categories: those applicable to the overall effort, and those that apply to the respective circles. The principles applicable to the overall effort are as follow:

- Top management and critical staff (e.g., engineers) must be committed to and support QC teams over the long-term. (There is an implicit contract that management will not use teams for their own ends only.)
- Everyone understands that, first and foremost, quality circles are a people-building process.
- Involvement should be voluntary at all levels of the organization.

- Management must recognize accomplishments of circles (and not punish mistakes or failures).
- There must be an extensive investment in training.
- Circles must be allowed to solve problems, not just identify them.
- The process takes time; patience is required.
- The process should start small and expand slowly.

With these principles guiding the overall effort, there are complementary guidelines for the teams themselves, including the following:

- Members work as a team, not as individuals. Everyone is responsible for the success or failure of the team.
- Teams should choose their own problems.
- All members of the team should participate in the problem selection and solving processes.
- Team members should criticize ideas, not people.
- Teams must—
  communicate openly
  develop good listening skills
  be open to new ideas.

These principles help teams establish an environment in which the teams model behavior they would like to see in the larger organization.

Organization and Staffing

The quality circle process fits into the existing structure of the organization rather than altering the structure. The relationship between the structure of the organization and quality circles is shown in figure 2. The QC consists of members of the normal work team. The immediate supervisor, if possible, becomes the team leader for the circle. In the circle, however, the normal hierarchy of supervisor-employee is adjusted to a problem-solving team structure.

The only position added to the existing structure is the QC facilitator. The facilitator is the staff person who coordinates the overall effort and works with the QC Steering Committee (if one exists).

There are up to six different roles involved in the QC process: management, steering committee, support personnel, facilitator, team leader, and team members. The respective functions of each role are described below:

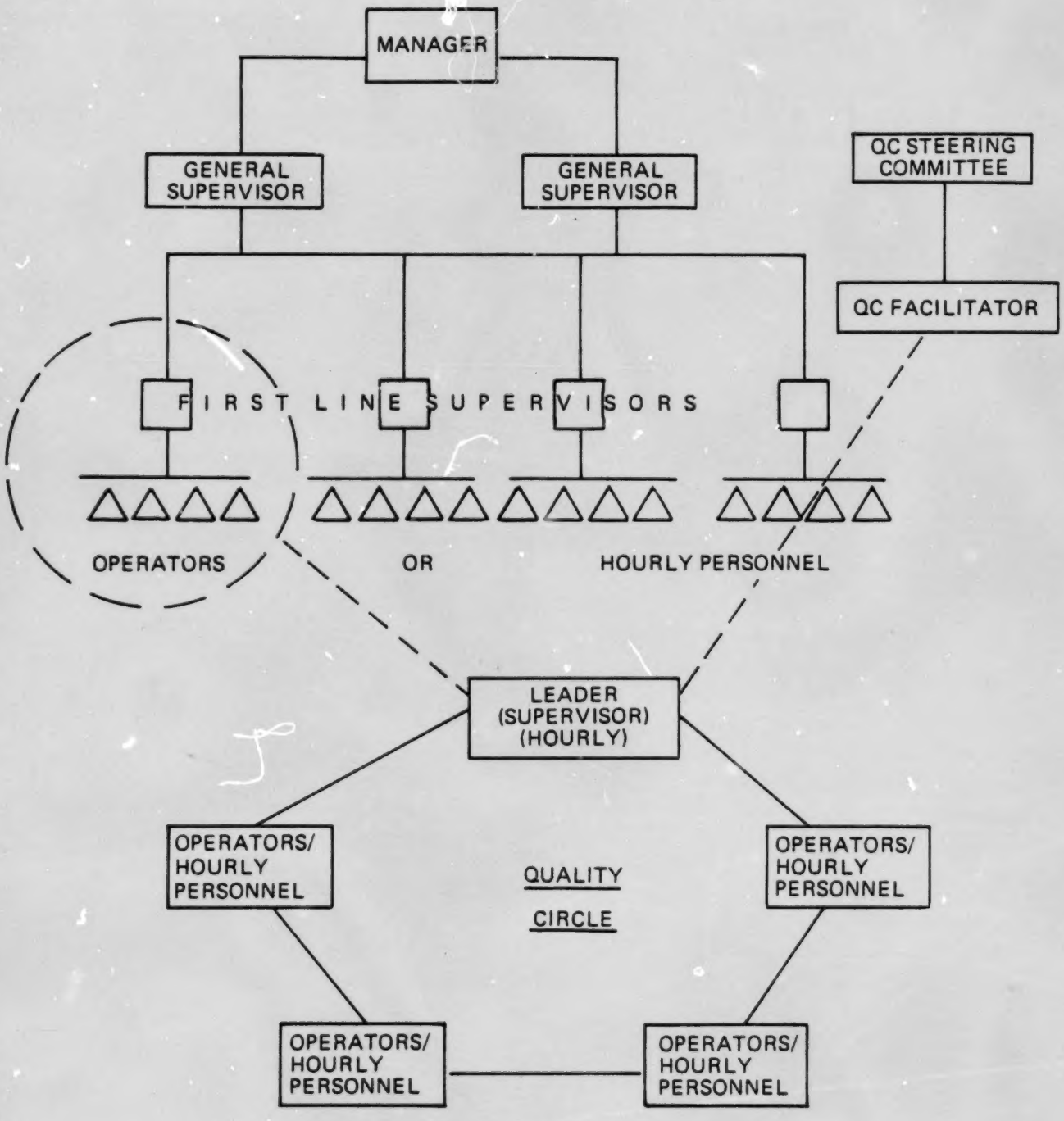

Figure 2. Organizational structure and the place of quality circles.

Role	Function
Management	Management's role is to develop the overall commitment to the effort. Once circles begin to operate, management must be supportive of the total effort in order for it to grow and develop.
Steering Committee	A steering committee, if used, will normally consist of representatives of the major organizational functions, and may include one or more representatives from labor. The committee serves in an advisory capacity and may perform such functions as planning, policy development, and evaluation.
Support Personnel	Many specialists (e.g., industrial engineers, management information systems personnel) in the organization will provide key help to circles. They will provide information critical to analysis, expertise in problem solving, and help in implementing solutions.
Facilitator	The facilitator keeps the QC process moving. He or she helps with organization, training, and support of the teams. There is also a critical interface role between circles and people critical to problem solving (e.g., support personnel, vendors, supervisors).
Circle Leader	This is the person (or persons) responsible for the overall success of the circle. The leader(s) must guide without taking control of the circle and must be supportive of the members. The leader is responsible for scheduling meetings, presiding at the meetings, keeping records, making between-meeting assignments, and so forth.
Circle Members	These are the volunteers who comprise the team. They are trained in problem solving and quality control tools, and apply this learning to problems of their choosing.

These groups work together in the QC process, which is described next.

The Operation of Quality Circles

The basic purpose of quality circles is to identify and solve work-related problems. Circles are formed by soliciting volunteers from specified work areas. The circle may consist of five to fifteen members, with seven or eight often cited as the preferred number.

Once a team is formed, members choose a leader or co-leaders. It is desirable to have the current supervisor of the work team in the circle serve as one of the circle's leaders. In this way, circle activities reinforce and strengthen the existing work team.

Circles normally meet once a week or at least every two weeks for one to one-and-one-half hours. In the early meetings, time is devoted to training the circle members (see later section for

discussion of training). Once they have the fundamental problem-solving and quality analysis tools, they begin to work on problems.

The QC will follow a cycle of activities to solve work-related problems. The steps are as follows (steps may vary as a function of the QC model employed):

1. Identify and Select a Problem	The circle identifies a number of problems that need to be solved, and uses a technique to select one on which to work.
2. Analyze the Problem	The circle may use a process called cause-and-effect analysis to identify the root cause(s) of the problem. In the process, the circle may employ techniques such as sampling, histograms, charts, and so forth.
3. Develop Alternative Solutions	After getting to a clear understanding of the cause(s) of a problem, the circle develops alternative solutions.
4. Choose the Best Solution	From the alternatives developed in the previous step, the circle chooses the best solution.
5. Develop an Action Plan	The circle goes beyond choosing a solution to developing a plan for making the solution a reality. The action plan includes consideration of the who, what, when, where, how, and why of solving the problem.
6. Present the Solution	An important feature of the QC process is the opportunity for the circle to present its solutions and action plans to management. Usually the first one or two plans are presented in person. After that, the circle may use written proposals for some problems, selecting only major ones for presentation.
7. Implement Solutions	The circle may, if appropriate, implement a solution approved by management.
8. Monitor the Solution	Once implemented, the circle monitors the solution to be certain it really does what it was meant to do.

The overall cycle of circle functioning is repeated as teams solve one problem and begin choosing the next one.

As circles mature and increase in skill, more leaders are trained and encouraged to start new teams. Circles that develop good problem-solving skills at one level may want additional training to move them to another level of skill (e.g., learning to use statistical regression analysis).

The Benefits of Quality Circles

There are three questions addressed in discussing the benefits of quality circles:

- Why measure benefits?
- What do we measure?
- What is the evidence of benefits to date?

Why Measure Benefits?

On the first question, Rieker says that management will require measurement as evidence of return on investment (ROI), because "deep down, at the really gut level, workers are considered to be extensions of machines; therefore, they are subject to the same mechanical computations we apply to those machines." (1981b, p. 157) This would be a case of circles having to do the right thing (evaluate themselves) for the wrong reasons. Rieker is by no means opposed to measurement, but says that even though the need to measure the impacts of QCs is generally accepted, "it is going to be difficult, if not impossible, to measure the full impact that QCs have on the performance of a group of such complex individuals." (Ibid.) Experience shows that things happen to people and in organizations that we do not customarily measure or that we do not have the technology to measure.

Even with the limitations, Rieker concedes some possible reasons to measure the outcomes of QCs:

- To convince management to continue a program
- To convince the work force to continue to support a program
- To assess the need to adjust or change a program (and how)
- To justify the allocation of funds to circles' efforts
- To satisfy management expectations

A reasonable rationale and perspective on measurement is presented by Tortorich et al. (1981):

> We need to measure to justify quality circles to budget-minded managers, to sell quality circles to skeptics, to guide our own implementation efforts and to guide circle members and managers involved in the quality circle. Any one of these reasons is enough to warrant a measures program. Together they make it an imperative.
>
> We have to measure to survive and succeed. But we need not get carried away. We do not have to prove in a controlled, scientifically rigorous sense that quality circles work. What we have to do is show that they are "working" in our organization—that they are improving the performance of the organization. We have to monitor, not prove. (p. 26)

What Do We Measure?

Based on the rationale cited above, Tortorich et al. provide a classification scheme for different kinds of measures. The measures fall into three categories: (1) program outcomes, (2) personal outcomes, and (3) organizational outcomes. A summary of the elements under each heading is shown in figure 3.

I. Organization Outcomes*
   A. Production rates
   B. Defect rates
   C. Scrap rates
   D. Attrition rates
   E. Lost time
   F. Grievance rates
   G. Accident rates

II. Personal Outcomes (use attitude instruments to assess)
   A. Quality circle process
   B. Perceptions of jobs
   C. Perceptions of self
   D. Perceptions of co-workers
   E. Perceptions of supervision
   F. Perceptions of management
   G. Perceptions of the organization

III. Program Outcomes
   A. Numbers trained (supervision, hourly)
   B. Circles formed
   C. Success rate (circles formed versus those now existing)
   D. Voluntary rate
   E. Types of problems chosen
   F. Direct cost savings

Figure 3. The Martin Marietta model of quality circle measures.

To this list can be added a fourth category, consisting of evaluation measures of circles:

IV. Evaluation of Circles
   A. Ingenuity of solutions
   B. Difficulty of problem vs. application of tools to problem
   C. Enthusiasm of the group
   D. The design and conduct of the management presentations (Rieker 1981b)

The two lists (figure 3 and Rieker's) provide a comprehensive catalog of the possible outcomes of QCs.

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*Tortorich et al. (1981) include some actual results of measures of organizational outcomes in this same article.

What Is the Evidence of Benefits to Date?

Although there is a long list of factors that could be measured to assess the benefits of QCs, there seem to be few published results other than those related to cost savings of the actual projects. A related form of cost information commonly reported is the ratio of cost (of circles) to savings. The estimates range from 4:1 to 8:1 (Tortorich et al. 1981; Yager 1981).

The Michoud Division of Martin Marietta has assembled an impressive array of nonfinancial data about its QC program (see Tortorich et al. 1981). The company reports, for example, the types of problems studied:*

Quality Improvement	38%
Cost Savings	15%
Safety	12%
Tooling	12%
Training	9%
Shop Flow	3%
Other	12%

At Martin Marietta, slightly over half of the problems deal with quality and cost savings. Other data available from the Martin Marietta program indicate a positive relationship between participation in QCs (six months or longer) and employee attitudes, a lower rate of grievances from QC members than from non-QC members, and fewer safety incidents and accidents among QC members than others.

A controlled attempt to assess changes in attitude is reported by Steel et al. (1982). The group monitored progress of a QC program begun at a Department of Defense installation in December 1980. The researchers had a two-fold purpose: (1) to assess the impact of QC activity on attitudes, and (2) to build a research paradigm that would provide valid and reliable data on the effects of QCs. The results of the initial pretest/posttest analysis indicate no significant difference ($p < .05$) between quality circle members and a control group on variables of job satisfaction, work group effectiveness, general organizational climate, and supervisory effectiveness. The authors caution, however, that final conclusions cannot be drawn because it may take longer than the first measurement period to see the effects of QCs. They plan additional analyses at various times in this project.

The following are overall conclusions from the review of the literature on the benefits of QCs:

- Management is probably going to demand accountability from QC efforts, and the efforts (including circles) need management feedback.
- There is a wide range of measures that can be used in judging the impact of QCs.
- At present, the majority of reported results of QCs are in the areas of quality improvements and cost savings; there is almost no information on the impacts of QCs on workers.

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*If the Martin Marietta data on circle activity are representative of the larger arena, they may account for the fact that most of the existing results are for cost savings and quality.

TRAINING FOR QUALITY CIRCLES

This separate section is devoted to training because training is the key element in moving QCs from idea to reality. Most of the existing models of QCs are built around extensive training components.* Training is directed at the four levels of people in the system—managers, facilitators, team leaders, and circle members. This section also describes the types and extent of QC training that can be delivered.

Training for Management

There are two kinds of QC training for managers, depending on their level in the management system. The first type is a seminar for top executives to help them understand the QC process, to move them toward a decision to implement QCs or not (or choose another approach), and to make them aware of the extent of management commitment required. The second type of manager training is targeted at middle managers. According to Cole:

> A concerted training program which involves all of middle management is necessary so that at least if they do not volunteer for the program, they will fully understand its needs and operations. (1980b, p. 15)

Middle-manager training can take the form of a general orientation program in which all middle managers become aware of the QC process, or it can be designed to provide middle managers with specific skills to encourage and support the QCs. For example, Honeywell Corporation (Kacher and Soule 1982) developed a three-module middle-manager training program which includes—

1. reinforcing team leader skills
2. diagnosing team problems
3. improving team leader performance.

Donovan says that building management support "is as important as training circle leaders or attending circle meetings." (1981, p. 78) In order for managers to become knowledgeable about quality circles, Donovan recommends segments on (1) understanding the QC concept, (2) developing ownership of the QC process, (3) developing personal value for managers in the QC process, (4) developing team support behaviors, and (5) using program evaluation techniques to provide feedback to teams.

According to the literature, the training for middle managers ranges from awareness experiences to the development of specific skills to support the process.

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*One exception is the Champion International model (Tewksbury and Kessinger 1982), in which team training modules are optional. Teams are started with a four-hour "appreciation training" experience, but after that choose training appropriate to their needs.

Facilitator Training

As the internal persons responsible for coordinating the QC process, facilitators receive the most extensive training. Quality Control Circles, Inc., for example, begins facilitator training in Phase I (decision to implement) of the implementation process and continues it through Phase III (first circle meetings). J. F. Beardsley (1981) uses a training program for facilitators with a manual that is almost three hundred pages in length.

The facilitator has to learn three kinds of things:

- The elements of the QC process
- How to train others in many aspects of the QC process
- How to manage the QC process in the larger system

As such, the facilitator needs content knowledge, some training ability, and systems skills. In many companies, the facilitator can involve the training department in the QC process in order to delegate some of the responsibility for the process. According to Reed and Olson (1982), the typical facilitator training course would include—

- introduction to quality circles
- problem-solving techniques
- advanced problem-solving techniques
- case study exercise (how it works)
- communication skills
- group dynamics skills
- now to implement quality circles
- how to administer quality circles.

With this amount of knowledge and skill, it is easy to see why the facilitator becomes the key person in the QC process.

Team Leader Training

There is general consensus that QC team leaders need training in task skills and group process skills (Aymie, Greene, and Vickstrom 1982; Darnell 1982). Task responsibilities include such things as the elements of the problem-solving process (e.g., cause-and-effect analysis) and administration (e.g., record keeping). Darnell (p. 85) lists the following group process responsibilities:

- Gatekeeping—helping others to participate
- Consensus testing

- Harmonizing
- Encouraging
- Compromising

The leader training modules address the various task and group process skills. Because there are a number of different approaches to leader training,* a summary of the kinds of training provided is shown in figure 4.

TASK-ORIENTED MODULES	GROUP PROCESS-ORIENTED MODULES
Introduction to quality circles	Introduction to quality circles
Approaches to problem solving	Approaches to problem solving
Brainstorming techniques	Group dynamics
Data gathering	Motivation
Pareto analysis	Communication skills
Cause-and-effect analysis	Listening skills
Presentation techniques	Human behavior
Use of audio visual aids	Team building
Record keeping	Conflict resolution
Goal setting (team)	Member counseling
Evaluation techniques	Decision making by consensus
Assigning priorities	
Delegating responsibility	

Figure 4. Examples of task and group process training modules for QC team leaders.

Companies normally use training programs for circle leaders developed by consultants. Other companies adapt "canned" modules or add modules appropriate to their needs. The latter was the case with Westinghouse, which added a number of special supervisory training modules to its QC program (Jones 1982).

*See, for example, Aymie, Greene, and Vickstrom (1982); Darnell (1982). Team leader training has considerable overlap with team training, since the two roles cooperate to solve problems.

Circle Member Training

Quality circle members need two types of skills—task skills and group process skills. The task training focuses primarily on problem-solving skills (see figure 4, Task list). The task or basic problem-solving training provided by Quality Control Circles, Inc. (Rieker 1981a), for example, covers the following topics:

- Introduction to Quality Circles
- Brainstorming
- Cause-and-Effect Diagrams
- Cause-and-Effect Diagrams—Part II
- Pareto Diagrams
- Histograms
- Checklists
- Case Study I (Examples of use of techniques)
- Graphs
- Management Presentations

Beardsley and Associates (Beardsley 1981) recommend a ten-module program:

- Introduction to Quality Circles
- Productive Circle Meetings
- Brainstorming
- Cause-and-Effect Analysis
- Developing an Action Plan
- Data Gathering: Sampling and Checksheets
- Control Charts
- Histograms and Pareto Charts
- Charts and Graphs
- Management Presentation Techniques

The two lists give a good indication of the kinds of basic task skills required for effective QCs. In addition to basic modules, most training providers have advanced courses or modules in such topics as sampling and stratification, data-gathering techniques, control charts, data arrangement, and so forth.

Although there is a tendency for laypersons to think only of the task-oriented component of problem solving, the human relations or group process skills are equally important. Rykiel (1982) lists a number of group process skills that quality circle members need:

- Listening
- Clarifying
- Responsibility for self
- Participation
- Team ownership
- Group orientation
- Does not avoid conflict
- Conflict dealt with openly
- Understand and appreciate individual differences
- Taking responsibility for group's productivity

Even though there is a stated need for group process and human relations skills in QCs, there is limited evidence of planned training in these areas. The assumption, it seems, is that group process is the facilitator's responsibility and that, therefore, he or she should get the training. Companies that have a goal of self-sufficiency for teams, or that think teams are more effective if QC members have skills as leaders, may add group process training modules for circles. Westinghouse (Hattrup, Reed, and Rykiel 1981), for example, has added training in communications and team building to help circles develop.

The basic conclusions about circle training are the following:

- The universal training for circles is in problem solving (task).
- The task training is sequential (i.e., some training modules should follow other modules).
- Many QCs receive training in group process or maintenance skills.
- The training should probably be ongoing. Certain kinds of skills cannot be used until groups develop to a certain point, and a group may want additional training as needs arise.

- Special training may be needed for certain kinds of organizations and people (see, for example, Ingle 1982).

The scope and duration of training is a function of the goals of the particular organization, the goals of the QC effort, and the people involved.

QUALITY CIRCLES AND THE IMPLICATIONS FOR TRAINING

The implications for QCs and training depend, in part, on the view of the nature and purpose of quality circles. There will be one set of implications for training if the purpose of QCs is to improve productivity and quality control. A different set of implications will evolve if the QCs are viewed not only as problem-solving tools for productivity and quality control standards, but also as vehicles for bringing about deeper changes in the organization. This section reviews the implications of who is trained, what kind of training is received, when training is done, what kinds of considerations are made in designing and conducting training, and the outcomes or end results of the training process.

Who Is Trained?

The QC process requires training at all levels of the organization and for the various roles involved:

- Executives
- Union officers, committees, and so forth
- Middle managers
- Facilitator(s)
- Team leaders
- Team members

Failure to train any of these groups increases the chances that there will be difficulties in the long run with quality circles within the organization.

The major implications for training are as follow:

1. The quality circle process is one of the few in which training occurs at *all* levels of the organization.
2. The training tends to be "bottom heavy" in the organization, i.e., team leaders and circle members receive more training than executives and middle managers.

The value of involving everyone in the organization in some part of the training is mentioned often. In the long run, however, the process may reveal the need for more training at the middle and upper management levels in order for the process to become a strong and permanent part of the organization.

What Kind of Training?

There are three variables that affect training. First, training differs as a function of level and role (except perhaps for team leaders and members). Second, the *task* versus the *process* distinction is especially evident in facilitator and team leader training. Third, there is a less obvious *explicit* versus *implicit* distinction in training.

The content training differs by level as a function of the QC implementation process. Possible audiences and types of training are summarized below:

Who	Content of Training
Executives	Orientation to QCs, roles, implementation, and so forth, designed to increase awareness and commitment.
Middle Managers	Understanding the QC process, middle management's role (e.g., decision making) and support skills (e.g., coaching).
Facilitator(s)	Receives the most extensive training. Covers problem solving, group process, managing the QC process, how to train others, and so forth.
Team Leaders	Receive problem solving, group process, presentation, and QC team management training.
Members	Receive extensive training in problem-solving and quality control skills. May receive group process training.

It can be seen that training audiences learn task skills and group process skills. Case studies reveal, however, that there are no clear boundaries for who ought to be trained or for the type of training that respective groups should receive. In general, there is a feeling that the more thorough each level's training, the better.

The difference between explicit and implicit training involves the distinction between specific skill training and the resulting change in the organization. For example, while team leaders require skills in problem solving and group process (explicit training), their role as team leaders teaches them a new relationship to their employees and perhaps increases their leadership ability (implicit training). Team members learn problem solving (explicit training), but they may also learn that (1) the organization cares about them, (2) they can be recognized for their contributions, and (3) power can be redistributed via participation in solving problems (implicit training).

The implications for training are—

1. the organization needs to consider the training needs of various levels and roles in the organization;

2. the training plan should include task skills and group process skills;

3. consideration must be given to the potential for and effects of implicit training.

Because QCs are still generally in their infant stage in this country, there is still a great deal to learn about additional forms of training for quality circles.

Considerations for Training

There is increasing evidence that the type of organization and the target population influence some aspects of training. For example, some types of workers may be able to move more quickly to sophisticated statistical analysis techniques than other types. Or, it may be necessary to construct a different training plan for a high-technology communications company circle than for a circle in a blast furnace at a steel mill.

A second consideration is that training should reflect the goals of the QC effort. If the effort is designed to focus primarily on quality, then teams' training will be heavily weighted with quality control techniques. If a long-term goal is to make teams self-sufficient, then group process and meeting management skills should be added to training.

Third, the stage of development of the process (or teams) will influence the training schedule and content. For example, once a team learns the basic problem-solving process and applies it a few times, there may be an opportunity to teach the members more sophisticated data-gathering and analysis techniques.

As one looks at the previous considerations, it is clear that no single approach to training or curriculum is appropriate to or sufficient for the installation of QCs in a given setting.

Outcomes of the QC Process and Training

The outcomes of the QC process provide implications for quality circle training. Based on the survey of quality circles literature, the following are some examples of the outcomes of QCs and their relationship to training.

Outcomes	Relationship to Training
Improved quality and productivity	Most of the existing training is dedicated to these ends.
Organization functions better	By putting the QC system together, more problems get solved, relationships improve, and so forth. Training should identify these possibilities and build toward them (e.g., communications, data gathering).
Role change	Supervisors or team leaders become team builders, helpers, trainers, and so forth. Workers become more responsible, use more of their talent, and so forth. Training should explore, analyze, and reinforce the skills needed for new roles.

As many of the case studies indicate, the early evidence on outcomes of quality circles is very good (See Appendix A). Benefits associated with quality circle installations include improved quality, increased productivity, and reduction or elimination of unnecessary costs. The key to long-term survival is sound planning, effective training, and continuing support. Probably the most important fact to remember is that there are no "canned," perfect training approaches for QCs. Beyond certain basics, the type and extent of training will vary with the setting and the people.

Summary

Training is the heart of the QC movement. As such, the start-up and maintenance of a QC effort require careful attention to who is trained, the content of the training, the adaptations required for different types of organizations and different audiences, and the relationship between training and the intended outcomes of the QC effort. One major effect of the training in and methods of QCs will be vastly different work forces in many American businesses, industries, and agencies.

SOME UNRESOLVED ISSUES IN THE QUALITY CIRCLE PHENOMENON

Most of this paper has been devoted to explaining the nature and functioning of quality circles. Yet, some topics have not been discussed. These have primarily to do with the implications of QCs for management/supervision, research, and education. This final section touches briefly on some issues in these areas.

The Role of Management and Supervision

Most managers and supervisors have learned the basic skills necessary to survive, if not excel, in their present roles. Some move easily to a problem-solving relationship with QCs, others do not. What happens to these people if one of the following is the case?

- The controlling people in the organization are not really convinced of the value of QCs and hence do not lend a great deal of overall support.
- The organization begins to discover that there are too many supervisors doing the wrong things (e.g., controlling people versus solving problems) in their present jobs.

In the long run, if organizations adopt the philosophy and principles of QCs, there will be other problems arising with which the current organization may not be prepared to deal. Surely the role of management and supervision in the future is one of these issues.

Research

The QC movement proceeds with little or no supporting research. Something is known about the positive quantitative effects of the QC movement in Japan, and some results are available on the effects of group problem solving versus individual problem solving. There is little or no information about some of the following questions:

- To what extent does culture (philosophy, mores) help or hinder the QC process? How is the process or content modified from culture to culture (or should it be)?
- To what extent have the underlying human development theories been tested in interaction with each other?
- Why do QCs fail in some organizations? (Reports from the early years concern only the ones that work.)
- What long-term organizational changes are necessary to sustain the QC concept?
- How will the QC movement fare if the nation's economy gets better and the U.S. regains a superior world market position?

- How does a successful QC experience change employees (socially, psychologically, technically and so forth)?

These are but a few of the questions pertinent to a better understanding of the QC phenomenon. At this point, however, far more energy is being devoted to "doing" QCs than to asking and answering significant questions about them. There is a need to conduct on-going research and evaluation of the phenomenon so there is some basis for interpreting success or failure.

Education

Very little has been said about what changes may have to occur in education as American companies adopt QCs. The educational system has been certifying managers and providing skilled workers for American business and industry for most of this century.

Will schools of management have to revise curricula to include sections on managing the new workers? Will vocational-technical schools have to add modules on being a participative employee? Perhaps there is a deeper question: Will educators who may never have experienced the kind of work place which created the economic and work problems we now have understand what to do to help support the kind of changes that are taking place?

The problem may be that by the time most educational institutions catch up with the QC movement, American companies will be off into something else.

Summary

The quality circle movement is so new and is growing so rapidly that some important adjuncts to change—the people who manage people, research, and education—are lagging behind the process. This seems to increase the risk that something could go wrong, simply because we are moving so quickly and with so many unanswered questions.

Yet, if the process were to wait for the questions to be answered, the next century might get here before QCs. The phenomenal growth of QCs speaks for the need. We can only hope that the QC movement will become a permanent, integral part of the work lives of Americans.

APPENDIX A

Excerpts of Reports on Quality Circle Activities in Various Industries

The text outlines the history and development of quality circles but presents little information on the kinds of problems circles solve and the impact of their solutions. Selected examples of QC efforts are included in Appendix A to give the reader a better understanding of the quality circle process.

Sources: Rieker, W. S. *Quality Control Circles: The Key to Employee Performance Improvement*. Saratoga, CA: Quality Control Circles, Inc., 1981b. Rieker, W. S. *Update*. Saratoga, CA: Quality Control Circles, Inc., November 1981c. Rieker, W. S. *Update*. Saratoga, CA: Quality Control Circles, Inc., February, 1982. Seib, R., ed. "Circles: Casting Employees Rally 'Round Product Quality." *Ford World, Ohio Section* (June 1980). Reprinted by permission.

Update, Saratoga, CA: Quality Control Circles, Inc. (Rieker 1981c)

Martin Marietta (Orlando, Florida)

The Ocala Target Detectors initiated a scrap solder reclaiming program "that has saved nearly $5,000." The Ocala Miracle Workers developed a method of close tolerance trimming of printed circuit flex harnesses, using a steel rule instead of the current hand scissors method. Result will be a significant reduction in scrap rate as well as an estimated 410-hour savings.

Pertec (Chatsworth, California)

A cost accounting circle updated physical inventory procedures, and set up support procedures and training classes for their use. More than $23,000 was saved in the last physical inventory as a result of its suggestions. Another group created storage area for PCBAs by salvaging unused shelves, and painting and assembling them on their own time. One member stated, "Now that I can have an impact, I'm working with the company, not just for it."

QWIP Division, Exxon Office Systems Company (Altamonte Springs, Florida)

The Troubleshooters, Inc., Team recommended change to a manufacturing test process which resulted in reduced use of specialized test equipment and removal of unnecessary parts in each unit. The suggestion was approved, with projected savings of over $50,000 in the next eighteen months.

Bank of America (San Francisco, California)

The Kan Do Its, a data-entry circle, made a simple suggestion that "was adopted, saving us $46,000." It proposed use of rubber bands instead of staples to attach batch headers in order to preclude batchers stapling over data which had to be keyed. This had been a constant source of irritation to 400 keyers. The Nightcrawlers changed batching procedures and saved an average of fourteen person-hours a day with the new method. In the Los Angeles area, QC Silents, a circle of deaf operators, are using sign language in meetings, tapping a human resource otherwise unavailable and enabling them to present their recommendations to management. Total savings by Bank of America's circles to September were $162,900, with more expected.

Polaroid Corporation (Norwood, Massachusetts)

The Straight Line circle targeted the need for improved flow of information from the designer to the drafter. The circle developed a folder of more detailed, better organized information that includes all necessary data needed to complete the assembly. The result was improved efficiency and less duplication of effort.

Naval Air Rework Facility (NARF)-North Island (San Diego, California)

The 81 Packer circle of the Preservation and the Packaging Shop suggested that sheet cardboard be pre-cut to specific sizes and stored for use as needed. Previously, items had to be measured and the box cutter constantly adjusted to suit the many sizes of boxes, resulting in production delays. Six months after implementation, documented savings were $208,838.

In the Cleaning, Processing and Sandblast Shop of the NARF Components and Metals Division, a circle found the current procedure could not remove most of the paint from components. It suggested the use of an epoxy dip tank stripper, and asked the Chemical Branch of the Materials Engineering Lab to test the idea. The group agreed and a refined version was implemented. A four-month savings of $150,000 is estimated due to reduced material costs and processing time.

Update, Saratoga, CA: Quality Control Circles, Inc. (Rieker 1982)

General Electric (Louisville, Kentucky)

The Door Fabricators circle is still lowering scrap and rework costs on refrigerator doors by reducing handling dents. So far, it has saved $6,000 through its efforts, and a 1982 savings of $77,000 is projected. The second-shift Sundowners circle's system of reworking valve plate leaders has been proven to save 70 percent of the "leakers" formerly scrapped, with an annual savings of $22,000.

General Telephone and Electronics Switching and Telephone Corporation (Genoa, Illinois)

One circle, the Quality Octagons, has been astutely addressing quality in the coil winding area on many levels and has proposed several solutions. It has designed a new potting nozzle head, reviewed oven cycle time, and changed inspection methods. Another circle, the Brainstorm Buddies, has saved considerable time and money through its collective ideas: $20,900 through manufacturing changes to the DSS console; $7,000 by eliminating shellacking of lever keys; and $6,000 through a new staging procedure for housings.

Bank of California (San Francisco and San Diego, California)

Literally hundreds of potential projects have been pinpointed. One circle is addressing the problem of what to do about the incorrect processing of merchant deposits by mail and telephone. The Mail Raiders circle is grappling with the chronic problems caused by needing at least two staff members present to deal with registered mail. The Brainy A/R Swingers circle developed uniform microfilm procedures to deal with the flood of corporate client transactions.

Stanadyne (Chicago, Illinois)

Facilitator Roy Foellmer writes of a resoundingly successful open house held recently at the plant—the first of its kind that has been held anywhere by a company's circles. A crowd of

fifteen hundred attended, including employees, families, friends, managers, and the local union's president. Visitors toured the plant and saw first-hand the efforts of a dozen circles. Exhibits included a new, improved feeding belt suggested by the Glass House circle and a more efficient method of resetting drill heads contributed by the Cone circle.

RCA (Scranton, Pennsylvania)

Though many new circles have been launched, the Pioneers, one of the three originals circles at RCA, is still turning out clever, original ideas. This circle collected a suggestion award—RCA shares its savings with employees—totalling $8,917.50! The Pioneers saved $59,450 as a result of its collective brainpower, and then began working on ways to help alleviate product flow problems in the Mount Seal/Exhaust Department. Suggestions included adding line monitors to some conveyors, storage racks for scrap, and rework and procedure change.

Franklin Electric (Siloam Springs, Arkansas)

The majority of circles began analyzing vendor-related problems a year ago. Meetings between vendors and circles were arranged and problems discussed. Triggered by the support and interest of the company's purchasing agent, the meetings developed solutions, one of which has saved $18,000 to date. Another circle created a new procedure for separating acceptable from faulty parts soon after receipt, thereby allowing the firm to return the defective parts for a cost-credit.

"Circles: Cast Employees Rally 'Round Product Quality." *Ford World*, Ohio Section (Seib 1980)

Many accomplishments of the quality circles at Cleveland Casting Plant pertain only to the casting business. Others are more general, involving safety and convenience as well as quality. The following are examples.

Many elements go into the cores and molds used to make iron castings at Cleveland Casting Plant. These elements include sand and water, which are blended in a giant mixer called a mullor. One circle, named the Pathfinder circle, recommended installation of load meters that can determine, by changes in amperage, the proper consistency of the batch. Said Pathfinder circle leader John Vargo: "The mixer operator can check the load meter to see if the mixer motor is drawing the proper amounts of electrical current. If the load is too wet or dry, or if some other element is not right, the operator can stop it and make necessary corrections."

Another quality circle—the Stop Our Scrap (SOS) circle—recommended installation of a larger work platform for core inspectors on a mold line. "The inspectors' job is to check for defective cores as they arrive from the core room," said leader Jerry Simcak. "The new platform provides a working area almost twice as big as the old one. The inspectors can move around and have better visibility as they inspect the moving cores."

The SOS circle also recommended relocation of mold spray booth controls. "Before iron is poured into a mold, we spray it with a refractory that improves the finish on the casting," explained Simcak. "Previously, the operator had to leave his position if he wanted to adjust the spray application. Now he can adjust it easily from his work position."

Quality Control Circles: The Key to Employee Performance Improvement, Saratoga, CA: Quality Control Circles, Inc. (Rieker 1981b).

Lockheed: Savings at 6 to 1	**Savings**
• Improved styles and types of test bases	$ 65,600
• Spray-coated PC boards instead of flow coating them (reduced defects)	380,000
• Developed process to desolder and remove hybrids from PC boards without damage to hybrids	388,000
• Buddy check systems; a systemized team effort in assembling cables reduced the NCRs	54,000
• A method of applying silver solder to triaxial cables; this reduced number of cable rejects	6,250

American Airlines

• Weld Shop circle—Verified that reconditioned hand grinders saved person-hours and money versus using old ones	115,000
• Mechanical circle—Redesigned shop area to eliminate $50/hour down-time on machinery and provide supervisors's office space on shop floor	250,000

Harley Davidson Company Problems	**Solution**
• Defective centers	Reprocess parts to standardize to fewest size center possible. Clean centers with flexible abrasive stick (save $1,200 year).
• Wrinkles in fiberglass	Update process data sheet to inform operators how to improve quality.
• Lack of operator training	New training format recommended.

3M Company Problem	**Solution**
• Difficulty in locating tools	Establish system of color codes. Management agreed to suggested color coding of plant. Crowded work area; redesign of pallet handling along with alterations of material flows, resulting in 10,000 square ft. of space saved.

APPENDIX B

Sample Tools of Problem Analysis and Solution:
Dover Elevator Q Squad Case

This appendix contains an abbreviated case of a problem solved by a quality circle. The summary data for each step are shown on the respective pages. (Note: Dates shown with headings indicate time progress from start to finish.)

Source: Dover Elevator Quality Squad. "Quality Cost Schedule." Presented at the Third Annual IAQC International Conference, Louisville, KY, March 4-6, 1981. Reprinted by permission.

Dover Elevator (Louisville, Kentucky)

QUALITY CIRCLE MEMBERS

DEPT. 581: "B" ASSEMBLERS & PACKERS

Zella Baldwin ..... B Assembler

Barbara Beltz ..... Packer

Jettie Conn ..... B Assembler

Rosiland Hall (Secretary) ..... B Assembler

Teresa Harris ..... B Assembler

Joe Hill ..... Utility I

Ann Keel ..... B Assembler

Stylant Kylce ..... Packer

Herman Rice (Assistant Leader) ..... Packer

Harriet Thompson ..... B Assembler

Elvis Walker ..... Packer

Earnie Womack ..... B Assembler

LEADER:

Charlotte Ruppelt ..... Industrial Engineer

FACILITATOR:

Richard Twilley

SPECIAL ASSISTANCE:

Joe Jenkins ..... Training Specialist

INTRODUCTION

The *Q Squad* is made up of "B" Assemblers and Packers in Department 581. The "B" Assemblers are usually reclassified from Utility I. The utility classification has had very little training in recognition of parts, and the handling of tools. There is a high turnover in this classification. Generally, the packers reclassify from "B" Assembly and have become familiar with the parts and tools.

In determining our theme we all thought much assistance was needed in this area. Thereby, we strongly urge effective training of new "B" Assemblers prior to actual performance in their new classification. Also, any tool information and requirements should be listed in its proper place.

We feel this would eliminate trying to find out - What to use - Where to use -How to use. We will achieve a better Q.C.S. (quality) in our product.

BRAINSTORMING FOR PROBLEM THEME
(5-8-80)

As a first step in the process, the team members contribute problems on which they would like to work. The list developed by the squad is shown below. (No. 8 was selected in this case.)

1. Lift truck availability

2. Bad time standards

3. Parts identification
   (what does it look like)

4. Training - A - Blueprint Reading
   B - Shipping Memos

5. Tour R and D Lab

6. Looking for "Contract" Special
   Items to assemble or pack

7. Part No. on all Bagged Items

*8. Tools to Work With

   A. Who Furnishes What
   B. Listed on Routings

9. Training in use of tools

10. Material availability

   A. Vendor and Dover Made Parts

ANALYSIS OF THE PROBLEM

The respective problem-solving steps were followed and analysis tools used to work toward a solution.

THEME: Tools to Work With (6-12-80)

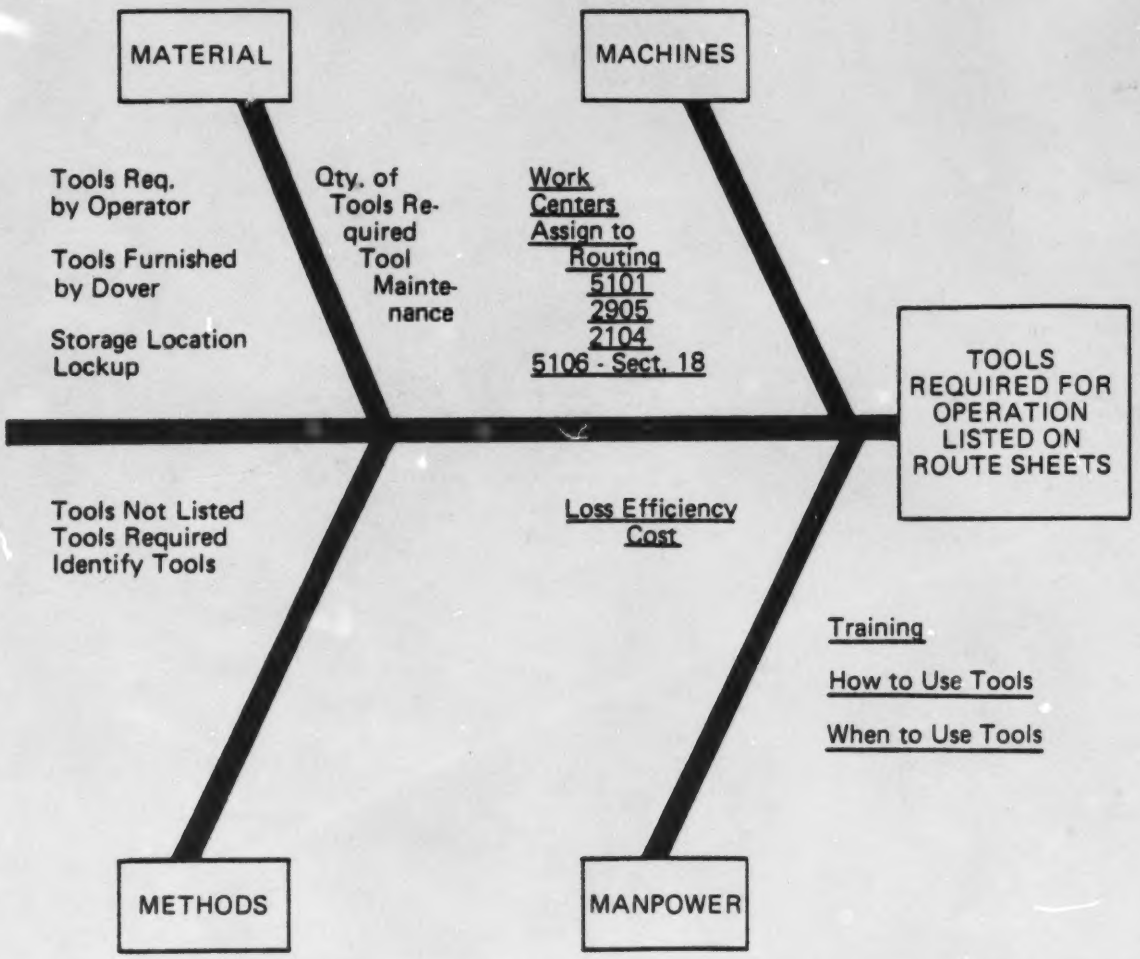
1. Tools furnished by operator were identified.
2. Tools furnished by Dover were identified.
3. Tools were listed on routings by operation and work center.
4. Tool changes per week by work centers were computed.
5. Lost time cost without proper tools was estimated.
6. Training

    A. How to use tools.
    B. Safety in operation of tools.

7. Quality was analyzed.

CAUSE AND EFFECT CHART (6-12-80/8-14-80)

Tools required for operation listed on route sheets.



TOOLS FURNISHED BY OPERATOR - IDENTIFIED (7-17-80)

B ASSEMBLER

1. Hammer
2. Screwdriver
    a. Straight
    b. Phillips
3. Adjustable Wrench
4. Pliers
    a. Standard
    b. Needle Nose
5. Wrench - 9/16" open end
6. Tape Measure
7. Standard Sockets
    a. Sizes: 5/16 - 7/16 - 9/16 - 3/4"
8. Punch

PACKERS

1. Claw Hammer

TOOLS FURNISHED BY DOVER IDENTIFIED (7-17-80)

B ASSEMBLER

1. Air Power Tools: Screwdriver - Impact Wrench - Stapler Sealer
2. Power Bits, Adaptors, Deep Well Sockets in special sizes. Sockets 15/16" -1-1/8" - 3/4" - 11/16"
3. Nylon or Rawhide Hammers
4. Hand Files
5. Hand Tape Dispensers
6. Special Stamps and Stamp Pads
7. Extra Large Pipe Wrenches
8. Vise
9. King Size Felt Tip Marker, Black and White Markal Paint Sticks
10. Snap Ring Pliers: External - Internal

PACKERS

1. Signode Air Bander
2. Duo Fast Staple Gun
3. Signode Pascode Nailer
4. Special Stamps and Stamp Pad

    a. 2 in box H Sect. 18
    b. 4 in box
    c. Date
    d. Clock No.
    e. Handle With Care
    f. High Pot Test
    g. Figure Adjustable Stamp with Special Letters

5. Hand Tape Dispenser
6. Utility Knife
7. Marker Felt Tip
8. Steel Bander and Dispenser

9. Steel Band Cutters

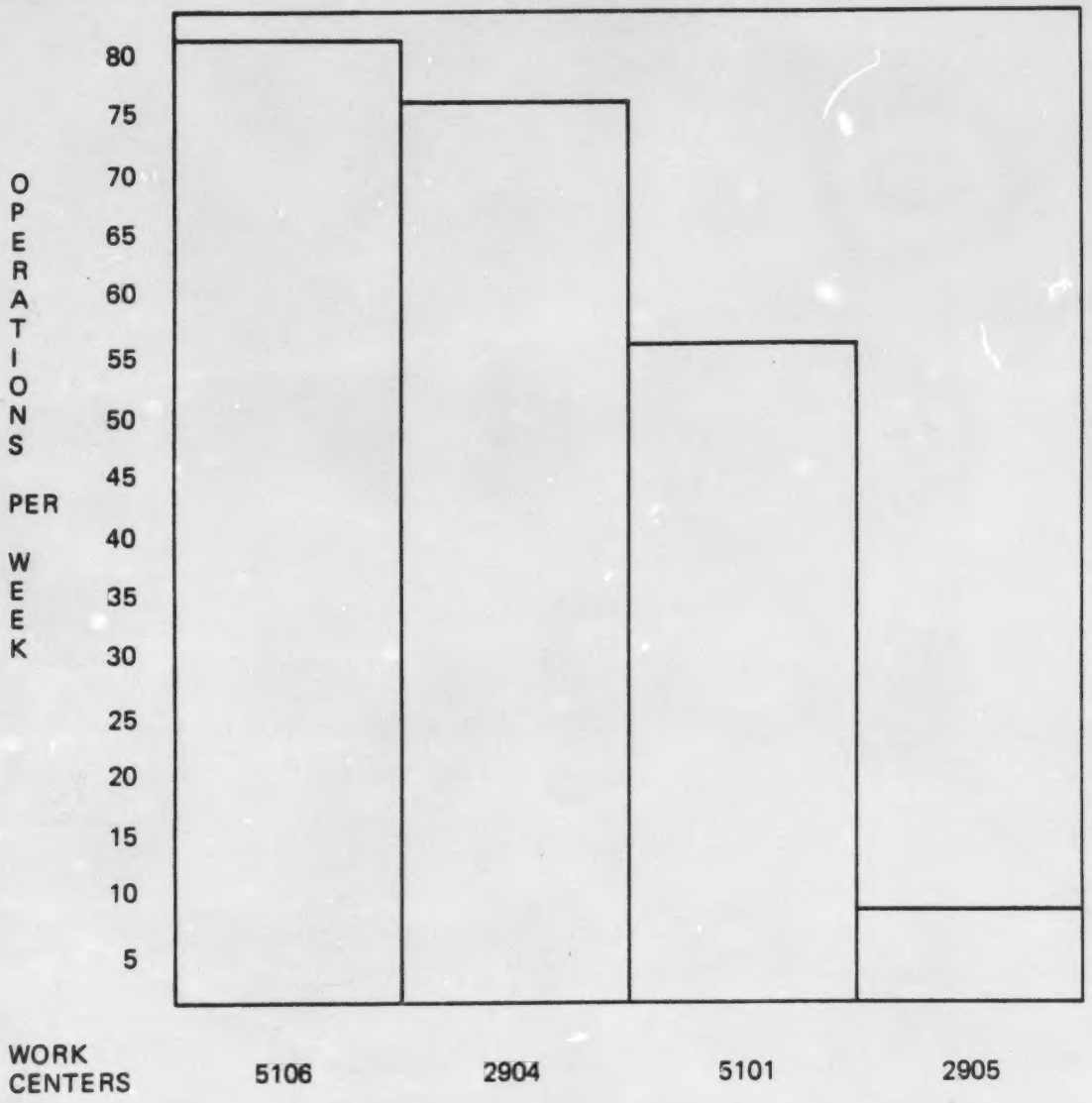
10. Sect. 18:

    a. Hacksaw and Saw Blades
    b. Crescent Wrench

Pareto Chart on Tool Changes (7-29-80/8-7-80)

This pareto chart represents the number of operations by work centers for a period of one week.

To develop this data each member made a check sheet for one week. These check sheets were tallied for final analysis.



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Pareto Chart on

COST OF TIME LOST - TOOL CHANGES

This pareto chart represents the cost of time lost on tool changes by work centers during one week. Through time studies we found an average of .1 per hour occurred per operations when tools were not listed on the route sheet or were not available.

5106 - 80 operations X .1 Hrs. = Total of 8.0 Hrs.
Crew of 2 at $11.80 x 8.0 Hrs. = $95.00

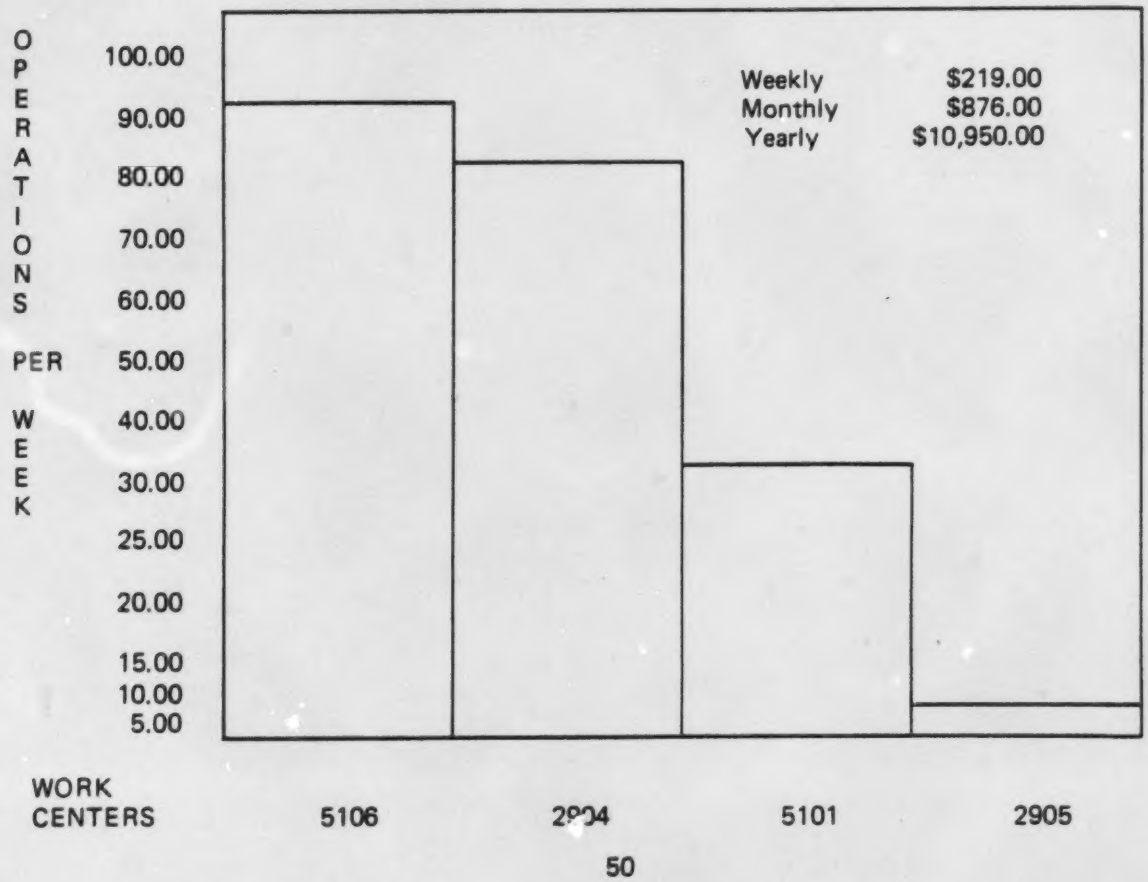
2904 - 75 operations X .1 Hrs. = Total of 7.5 Hrs.
Crew of 2 at $11.53 X 7.5 Hrs. = $87.00

5101 - 31 operations X .1 Hrs. = Total of 5.5 Hrs.
Crew of 1 at $5.63 X 5.5 Hrs. = $31.00

2905 - 10 operations X .1 Hrs. = Total of 1.0 Hrs.
Crew of 1 at $5.63 X 1.0 = $6.00

COST SAVINGS

WITH TOOLS LISTED ON ROUTE SHEETS



THE SOLUTION:

PROPOSED TRAINING PROGRAM

Section I

Slideshow on Dover (30 minutes)

A. To explain what Dover does; what we make.

B. Slideshow on "What is an Elevator?"; to explain the parts, the function of an elevator, what types Dover makes; parts of an elevator.

C. Test: To evaluate what we learned.

Section II

Instructor from Q Squad (1 hour)

A. List all the tools for "B" assemblies and how they are used.

B. Instructions on the safety of using the tools.

C. **Loss of production occurs when employee is hurt.*

D. Test: To evaluate how many tools we know, and how to use them safely.

Section III

How to Fill Out Forms Correctly (30 minutes)

A. Time cards, route sheets, etc.

B. Assembly procedure: Step-by-step instructions.

Section IV

Classroom (1 hour)

A. Very basic course in blueprint reading: Assemble parts from prints.

IMPLEMENTATION

1. Q Squad members have finished the posting of required tools to each operation on respective routing copies ..... $ -0-

2. Industrial Engineering put into CRT and adjust I.E. file folder - 8 hours = ...$ 48.00

   The I.E. will make tool assignment on new parts and ECOs during normal processing of routings. This will assist in training new I.E. in tool requirements for various assemblies in Department 581.

3. Training - 4 hours for each "B" Assembler.
   $5.63 per hour X 4 hours = $22.53.

   In the past year our records indicate 18 people transferred to "B" Assembly. 18 X $22.53 = yearly cost of.....$405.54

4. Department 581 budget on small tools, bits, sockets the past four (4) years has averaged $450.00 per year. The Power Tools in 77-78 cost $953.00. The 79-80 is $1,034.00. These figures represent "A" & "B" Assemblies. This cost is not incorporated as it is already budgeted..... $ -0-

   Total Cost/Year $553.54

5. Yearly Savings.....$10,950.00
   Yearly Cost..... 553.00
   Total Savings $10,397.00

APPENDIX C

Results of a Survey of Eighteen Companies' Involvement in Quality Circles

Source: Wilson, D. "Quality Circle Survey Results." *Quality Circle Digest* 2 (February 1982): 16-29. Reprinted by permission.

The following pages contain the tabulated results of the Quality Circle Questionnaire conducted in August by Sperry Marine Systems.

Eighteen companies responded, 28% of those who received the questionnaire. Overall, survey responses indicate that Quality Circles, as a concept, is healthy and will continue to grow over the next few years. Response statistics indicate that:

- On the average, over 83% of all Quality Circle suggestions are implemented
- Departments with Circles run the gaumut from accounting to quality control and are fairly equally distributed among both administrative and factory personnel
- In ranking areas of Quality Circle impact, respondents cited:
  —Communications (ranked 1 or 2 by 72%)
  — Morale (ranked 1 or 2 by 33%)
  — Productivity (ranked 1 or 2 by 33% and 3 or 4 by 30%)
- In 95% of the cases, respondents agreed that Quality Circle achievements outweigh operating problems.

For all of you, I hope the information will be as useful and thought provoking as it has been for us here at Sperry.

February 1982, Quality Circle Digest

Response	ADMINISTRATION (continued)	PROCESSES					
	Level Mang. Steering Committee	Rank Most Necessary Ingredients for Quality Circle Success					
		Training	Mang. Supp.	Awards	Recog.	$ Return	Other
1	Top, Middle, First-Line	1	3		2	4	
2	Top	2	1		4 (Incent. Profit Share.)		3 ROI—Circles must get results
3	Top, Middle, First-Line	3	1	5	2	4	
4	Top	3	1		2	4	
5	Top, Middle	2	1		3	4	
6	Middle	3	1	4	2		
7	Top	3	5	2	1	4	
8	Middle	2	1		3	4	
9	Top, Middle, First-Line	4 (Top & Middle)	1		3		2 (Union)
10	1 – No Response	2	1	5	3	4	
11	Middle	2	1		3	4	
12	Top, Middle	2	1	5	3	4	
13	Top, Middle	3	1		2	4	
14	Top (At the Location)						
15	Top, Middle	1	2	4	3		
16	Top, Middle, First-Line Circle Members	2	1		4		3 (Emp. on People-Building)
17	Top, Middle	3	1		4		2 Voluntary Participation
18	Middle	2	1		3		4 (Enthusiastic Facilitator)

Response	GENERAL				ADMINISTRATION		
	No. Employeed	Began Circles	No. Circles	% Employees In Circles	Departments with Circles	How Administered	Steering Committee Representation
1	6	1/81	1	100	Ship. & Rec., Adm.	No Facilitator	All
2	250	Late '79	24	87	Acctg., Eng., Mfg., Sales	Full-Time Facilitator	No Steering Committee Facilitator reports to Staff
3	320+	5/80	12	55	Dist. (Whse.), Production, Quality Control, Secretarial/Clerical	Full-Time Facilitator	Middle Mgt., Top Mgt., Line Supv., Eng., Whse., Quality Control
4	1,046	1/80	4	4	Electronic Assy., Electronic Test, Mechanical Assy., Mechanical Insp.	Part-Time Facilitator	General Mgt., Engineering, Production
5	180 (Mfg. Oper.)	6/80	12	60	Acctg., Inspection, Materials & Stores, Mfg., Mfg. Eng., Production Control, Test	Full-Time Facilitator	Mfg., Test, Inspection, Ind. Rel., Materials & Stores, Mfg. Eng., Production Control, Controller
6	Iowa—350 M/W—550	3/79 10/81	13	50	Maintenance, Office/Clerical, Production, Tool Room	Full-Time Facilitator	Iowa—All Plant Mgt.
7	3,500	'76	50	50	Acctg., Maintenance, Marketing, Mfg., Production	Part-Time Facilitator	All Major Dept., Eng., Product Assurance, Production
8	6,000	6/78	26	20	Aircraft Maintenance, Component Maintenance, Computing, Engineering Secretaries, Machine Processes, Power Plant, Maintenance	Part-Time Facilitator	Quality Assurance, Production
9	20,000	'77	200+	10	Engineering, Financial, Material Control, Mfg., Personnel, Purchasing, Quality Control	25 Full-Time Facilitators	Eng., Financial, Material Control, Mfg., Personnel, Purchasing, Quality Control, Sales
10	800—1,000	4/80	13	9—10	Design, Element Dept., Engineering, Office, Piece Parts	Part-Time Facilitator	Chief of Eng., Factory Employees, Mfg. Mgt., Personnel, Quality Control
11	1,100	8/80	15	10	Maintenance, Material Control, Mfg., Tool Room	Full-Time Facilitator	Electronic Dev., Industrial Engineering, Quality Control, Supt. Mfg., Supt. Tooling & Trades, Training

Response	GENERAL				ADMINISTRATION		
	No. Employed	Began Circles	No. Circles	% Employees In Circles	Departments with Circles	How Administered	Steering Committee Representation
12	450	5/81	8	18	Engineering, Production, Production Control	Full-Time Facilitator	General Manager, Process Eng., Production, Quality Assurance
13	350	3/80	10	15	Paint (1st & 2nd), Press (1st & 2nd), Production Control (1st), Shelf Fab. (1st & 2nd), Tube (1st), Welding (1st & 2nd)	Part-Time Facilitator	Industrial Eng., V.P. Mfg., Personnel, Production, Purchasing
14	200,000	12/80	37 (5 loc.)	10—20	Telephone: Business Office, Central Office Equipment, Outside Construction Manufacturing: Acctg., Assembly, Engineering, Inspection, Production Control, Test	Full-Time Facilitator	Usually Acctg., Eng., Material, Mfg., Personnel, Production Control
15	1,943	'78	41	38	Assembly, Inspection, Machining, Office, Stock Rooms, Tool Design	2 Full-Time Facilitators (usually) 1 Coordinator	Administration, Eng., Materials, Mfg., Quality Circles, Quality Control
16	1,956	5/81	14	12	Maintenance, Mfg., Purchasing Quality Control, Receiving	Part-Time Facilitators Part-Time Coordinator	Eng., Maintenance, Mfg., Purchasing/ Receiving
17	60,000 (Domestic)	'78	95	1	Clerical, Engineering, Maintenance, Mfg., Quality Control	Full-Time Facilitator Part-Time Facilitator	Eng., Mfg., Operations Manager, Personnel, Purchasing, Quality Control
18	17,700	11/79	–	15	Administration, Component Mfg., Communications, Design Automation Div., Instrument Div., Purchasing/Distribution, Service, Tech. Group	19 Full-Time Facilitators	All Participating Areas

Response	PROCESSES – Continued						
	Rank Areas Where Q Circles Have Most Impact						Quality Circle Achievements
	Quality	Productivity	$ Savings	Communications	Morale	Other	
1	2	1		3			1. Distributed workload more evenly 2. Reduced shipment turnaround 50%
2		1	2	3	4		1. Reduced costs by $500,000 in 1981 2. Added 10% value increase in Mfg. 3. Increased employee training and motivation
3	3	2	4	1	5		1. Assembly procedures 2. Forms control and standardization 3. Rejects reduced
4	2	3	5	4	1		1. Rejects Reduced 2. Training Aids 3. Work Flow
5	1	3	4	2			1. Customer comments praising quality increase 2. Rework reduced, factory margin improved 3. Communication improved at all levels 4. Est. Savings–$110,000 per year
6	4	3		2	1		1. Wrote Assembly Specification Manual 2. Dev. special tool and procedure to clean test tank drain system 3. Recommended use of smaller brazing rod–result: 30% cost reduction
7	3	1	4	2			1. Increased productivity 2. Increased communication
8	4	2		1	3		1. $100,000/yr. saved with weld shop handgrinder standardization 2. $200,000/yr. saved with better environmental and maintenance controls in paint booth 3. $40,000/yr. saved by using thread protecting sleeve on major engine bolt
9	4		3	2	1		1. 1st-, 2nd-, 3rd-shift communications 2. Scrap reduced 2. Purchased part problems resolved
10	3	5	4	1	2		1. Cleanliness of plastic piece parts–60% cleaning to 2% 2. Better locations/quality of copiers 3. Found lost tools–$10,000/yr. saved
11	3	5	4	1	2		1. Small tools for operators 2. Clarified quality standards 3. Improved operator training
12	3	3	3	2	1		1. Increase in employee morale/sense of purpose
13	2	3	4		1		1. Feeling that Mgt. listens–personal employee growth 2. First year–2 to 1 payback over costs 3. Improved quality
14	3	2		1			No response
15	2	4	3	1			1. Improved supervisor/employee communication 2. Cleaner shop 3. Improved quality
16			3	1	2	4 Safety	1. Saved $22,000/yr. with improved work order system 2. Saved $1,800/yr. and improved safety with Mechanical Barrel Handlers
17	3	5	4	1	2		1. Improved working conditions–lighting, temperature 2. Improved tooling 3. Improved work instructions
18	3	4	5	1	2		1. 30% attendance increase (one Dept.) 2. Procedures documented 3. Overtime/waste reduced

Response	PROCESSES – Continued					
	Quality Circle Operating Problems		Operating Prob. Outweigh Achievements			Criteria to Measure Success
	Major	Minor	Yes	No	How?	
1	None			X		1. Turnaround 2. Observed employee attitude
2	1. Lack of Supervisor support/training 2. Lack of Group leadership	1. Time constraints on Facilitator		X		1. Company attitudes 2. Cost savings 3. Value added gains
3	1. Total Management Support 2. Action on recommended solutions	1. Production priorities		X		1. Objectives 2. Quality improvement 3. $ saved or cost avoided
4	1. Routings/split orders 2. Rejects at final 3. Training			X		1. Graphs 2. Charts 3. Cost Analysis
5	1. Maintaining member enthusiasm over time	1. Selection of problems by some Circles 2. Effect of turnover, transfers, and resignations on Circle momentum		X		1. Projected savings 2. Impact on Quality, Productivity 3. Management feedback on better communications 4. Attitude surveys
6	1. Overtraining Circle Members initially in problem solving techniques			X		1. No. accepted recommendations 2. % of total Dept. in circles 3. Recommendation quality
7	1. Continuing interest	1. Problem resolution		X		1. $ saved 2. Communication improved
8	1. Lack of Middle Mgt. support 2. High rate of Circle "infant mortality"	1. Delay in forming Steering Committee		X		1. Calculated 1st year benefit to total actual cost 2. Attitude surveys 3. Productivity studies
9.	1. Lack of Middle Mgt. support	1. Time to meet 2. Training		X		1. Participation increase 2. Problems solved
10.		1. Shutting line down for 1 hour 2. Replacing Circle member while in Circle meeting		X		
11	1. Leader unprepared for meeting	1. Establishing people-building philosophy 2. Having Quality Circles as a "way of life"		X		1. Operating costs 2. $ saved 3. Member/Leader turnover
12		1. Having a designated meeting area	X Early in prog.			1. Scrap/rework reduced 2. $ saved 3. Volunteer rate, employee attitude, verbal feedback
13	1. Clash between meeting time/production req. 2. Foremen not wanting to be leaders 3. If meetings on O/T, problem with baby-sitters, rides, etc.		–	–		1. $ payback 2. Attitude survey
14	1. Difficulty of some Circles finding problems of interest to tackle effectively			X		1. Subjective Mgt. evaluation 2. Employee attitude survey 3. $ saved 4. Performance measures
15	1. Layoff/transfer of Leader/Members 2. Supervisors, Managers, Leaders not motivating their people	1. Circle meeting room conflict		X		1. Scrap/rework costs reduced 2. Operation costs reduced 3. Observations relative to morale, rapport, etc.
16		1. Coordinating training modules and equipment		X		1. Measured achievements in people-building
17		1. Public speaking apprehension 2. Sustained attendance		X		1. Rejection rates 2. Labor efficiency
18	1. Personnel transfers 2. Managers not participating	1. Facilitator turnover		X		1. Circles meeting 2. Circles increasing 3. Attitude surveys, output, attendance

Response	PROCESSES – continued			How Management Supports Circles		Innovations
	Measuring System Effectiveness	% Circle Sugg. Imp.	Inactive Circle? How Determined	Top	Middle	
1	50	80	N/A	1. Attend meetings 2. Provide meeting place		1. Shortened up-front training from 8 hr. to 3 hr.
2	Not measured	60	Circle participation mandatory	1. Very supportive	1. Becoming supportive	1. Mandatory participation 2. Profit sharing
3	50	60	Action taken by Board of Directors as specified in by-laws w/approval of President	1. Good	1. Good in most areas	1. Other approaches to recognition 2. Emphasis on cross-training
4	80	90	–	1. Verbal 2. Plant meetings 3. Attend Circle meetings		1. Articles in house organ
5	80–90	100	Determined by Circle Feedback to Facilitator/ Steering Committee	1. Steering Committee members 2. Attend all Mgt. Presentations	1. Mention at Dept. meetings	1. Circle newsletter
6	We're happy with it	85	N/A	1. Visit meetings 2. Attend Mgt. presentations 3. Casual discussions with employees		1. Own meeting room 2. Hats & shirts
7	50	50	Become inactive by themselves	1. On Steering Committee 2. Recognition 3. Awards		1. Part-time Facilitators
8	75 Approx.	80 Approx.	Circle makes consensus decision	1. Ostensibly—but lack genuine enthusiasm	1. Most take hands-off approach	1. 2 Mgt. Presentations videotaped 2. Improved 3-day Leader Training 3. Mgt. Circles
9	Too soon to measure	Determined by group	Mutual agreement within Circle	1. Attend meetings 2. Off-site training 3. Staff presentations		1. Union coordinators 2. Staff presentations in Union Hall 3. Social/technical plant systems have evolved
10	N/A	100	1. Line moves out of plant 2. Lack of interest 3. No members left	1. Idea implementation 2. Work order issuance 3. Meeting attendance		1. Whole page in company newspaper
11	90	100	By Circle	1. Participate in Circle Activities 2. Provide areas, time, materials 3. Promote circle growth		1. Current members train new members 2. Non-members attend
12	Can't be determined	Unknown now	Not encountered	1. On Steering Committee 2. Donate time, knowledge, expertise 3. Approve expenditures		1. Guest lecturers, recognition "teas" 2. Color-coding blueprints, tool identification 3. Member badges; training certificates
13	75	95	By Circle	1. Company Pres. supports in all ways 2. V.P. for Mfg.—lip service only		1. Teach basic course in statistics 2. Teach Project Cost Justification
14	90	90	Circle decision	1. Provide Facilitator/ facilities 2. Attend Mgt. Presentations 3. Provide recognition		1. Two-day workshop for 2nd- and 3rd-level Managers
15	60	90	1. No attendance 2. No project selected	1. Attend Circle meetings and Mgt. Presentations 2. Provide assistance/ information 3. Obtain outside help		1. 1st- and 2nd-shift Circles meeting together on same project 2. Rotation system for Leaders —all members serve as Leaders 3. Non-departmental person is Circle Co-Leader
16	–	–	Circle decision	1. Attend meetings/ Presentations 2. Provide assistance figures 3. Providing meeting room/supplies		1. Steering Committee composition—diagonal slice of organization 2. Training—developed and conducted in-house 3. One part-time Facilitator per circle
17	Unable to isolate impact	80	Lack of participant interest	1. Participation 2. Implement suggestions 3. Employee newsletters		N A
18	–	90	Decision by Circle, Mgt., or both	1. Attend Mgt. Presentations 2. Talk about Circles 3. Have Mgt. Circles		1. Circle guidelines 2. More emphasis on goal-setting with Mgt. 3. Measurement system setup result of graduate student project

Response	PROCESSES—Continued: Benefits Offsetting Operational Cost? Yes	No	RECOGNITION: Ways for Circle Recognition	Types of Awards	MONETARY AWARDS: Pros	Cons
1	•		Opportunity to participate in making Mgt. decisions	None		Money motivates for short-term only
2	•		1. Company newspaper 2. Mgt. Presentations	Monetary for Cost Reductions	Motivation in America green	
3	–	–	1. Certificates 2. Quality banners—ind. and line 3. Newspaper/photos	1. Certificate 2. Photo 3. Banner	Should be in concert with other monetary recognition	Individual & Circle recognition in personal or take-home has been effective
4	•		1. Published in Company journal 2. Bulletin Boards	None	–	–
5	• 4/5: 1 ret.		1. Circle pins 2. Training certificates 3. Departmental meeting mention 4. Newsletter	Same as Recognition		1. Can breed "hard feelings" 2. Difficult to administer
6	•		1. Company/local newspaper articles 2. Bulletin boards 3. Hats	Same as Recognition	A quarterly Profit-Sharing Plan would promote participation	Don't recommend specific monetary rewards
7	•		1. Newspaper 2. Bulletin boards	Monetary and symbolic	Promotes short-range interest	Recognition needs to be long-range
8	• 2:1 ret.		1. Mgt. Presentations 2. Company newspaper articles 3. Aisle displays 4. Town newspaper articles	Suggestion Program Awards when received		Workers more interested in eliminating various work frustrations than getting paid
9	•		1. Presentations 2. Plant displays	1. Training 2. Recognition	Money necessary to implement group needs	Can't buy commitment
10		•	1. Presentation 2. Company newspaper articles	1. Within work itself 2. Possible salvation of a job		1. Possible idea-stealing 2. How to recognize who did what % of work 3. Money might control problems worked
11	• 2:1 ret.		1. Mgt. Presentation 2. Pictures in Company newspaper	Training Certificates		1. Circle Members don't want special awards 2. Not part of program
12	N/A	N/A	1. Newsletter articles 2. Recognition lunches, teas 3. Bulletin board displays 4. Photos posted	1. Certificates (Duplicate to Personnel files) 2. Membership Badges		1. Not planned 2. Circle Members proud of accomplishments
13	• 2:1 ret.		1. Better Mgt. Presentations reenacted at monthly Staff Meetings	None		1. If used, someone always close but not a winner 2. Money doesn't always reflect degree of thought/effort 3. If Herzberg & Maslow correct, better motivators exist
14	•		1. Mgt. Presentations	Intrinsic		1. Perceived inequity 2. Hard to measure real work output in dollars
15	•		1. T-shirts 2. Company newspaper 3. Belt buckles for leaders 4. Bulletin boards	Company merchandise		1. Difficult to administer
16	•		1. Jackets, caps, T-shirts 2. Certificates/placques 3. Company newspaper	1. Present-none 2. Developing Service Award Plan		1. Tend to emphasize short-term 2. Not people-building philosophy 3. Circles may work on "money" projects first
17	•		1. Team name 2. Posters, emblems 3. Newspaper articles 4. Bulletin board	1. Personal Mgt. thanks 2. Mementos 3. Photos 4. Bulletin board announcements		1. Most participants consider professional stature over rewards 2. Personal recognition and job security more important
18	•		1. Mgt. Presentation 2. Newsletters	1. Certificate 2. Lunch 3. Photos in newsletter 4. Profit Sharing		1. Perceived unfairness 2. Difficult to administer

	UNIONS			FUTURE		
Response	% Union	Union Involvement	Union Reaction	12-Month Plans	24-Month Plans	Innovations/Changes?
1	N/A	N/A	N/A	Sustainment	Sustainment	None
2	N/A	N/A	N/A	1. Increased training 2. Inter-team cooperation and involvement in problems	1. Gradually phasing out Facilitator	Supervisor training
3	N/A	N/A	N/A	1. Include 60% of plant 2. Recommendation emphasis on quality and productivity 3. Gain total Mgt. support	1. Reach cost effectiveness 4:1	1. More developments in recognition 2. Refine measuring criteria 3. More Leader recognition and development
4	N/A	N/A	N/A	No Response	No Response	No Response
5	N/A	N/A	N/A	1. Continued growth 2. Involve other Dept. & Div.	1. Move more to problem prevention 2. Joint meetings to solve department-wide problems	1. Advanced training for Circle Leaders/Members
6	Hourly–100*	Iowa–3 of 5 Union Union Committee persons in Circles 1 union person on Steering Committee at M/W	Neutral to positive	Install in M/W plant	1. Expand to both plants 2. Train all Supv. 3. All employees get chance to participate	None at present
7	5	They participate	So-so	Continue	Don't know	No Response
8	75 approx.	Most members are Union members	1. Quietly supportive-have monitored program since start 2. Union Stewards Circle Leaders	Expand in current location	Expand into other Company locations	No Response
9	85	Equal with Mgt.	Asked, "Why didn't we do this 25 years ago?	Expand as Circles evolve–not faster	Same	1. More Middle-Mgt. training 2. Use statistical 3. Training-training-training
10	90	Have participated since start	Favorable	1. 6 more Circles in Assembly 2. More active Steering Committee 3. Develop new leaders	1. 12 additional Circles 2. Foremen as Leaders 3. Circles working with Circles	1. Better training material
11	N/A	N/A	N/A	1. Expand to 25 Circles 2. Training in basic statistics 3. White collar Circles	1. Part-time Facilitator from Middle & Top Mgt. 2. Greater use of control charts to monitor	1. Combine Circle groups-Ex: Mfg. & Design
12	N/A	N/A	N/A	1. Expand to other production areas 2. Introduce to Supv., Production Support, and Clerical Staff	1. Closely monitor program for changes and improvements	No Response
13	N/A	N/A	N/A	No Response	No Response	No Response
14	80	1. Some support from sidelines 2. Others want to negotiate conditions and co-manage Circles	Usually neutral to positive	Careful expansion	More expansion	No Response
15	65	1. Union members offered Leader training 2. Union bargaining member a Circle Leader	1. Wait and see 2. No apparent encouragement or discouragement	1. Have Quality Circles in in third plant 2. Increase to 75 Circles	1. 85% of all employees in Circles 2. 100 Circles	1. Add tool designers, process engineers, industrial engineers, and quality control people to existing Circles
16	N/A	N/A	N/A	1. Add 15 Circles 1982 2. Fully implement recognition program	1. Add 15 Circles 1983 2. Add "white-collar" Circles	1. Move toward Circle self-maintenance so that no one person is totally concerned with Circle activities
17	90	1. Pre-implementation briefing 2. Circle participation by Stewards	1. Positive–good support	Moderate growth at plant level	Continued growth	No Response
18	N/A	N/A	N/A	1. Maintain & expand. 2. More Mgt. Circles 3. Use statistical techniques 4. New reporting system	1. Continue training Managers and employees in statistical techniques	1. Increase use of statistical techniques

*Iowa Right-To-Work State
so 10% not union members

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